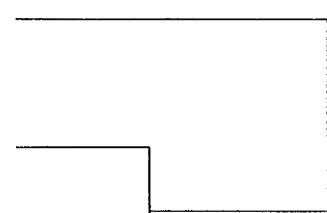Symbol   Probability

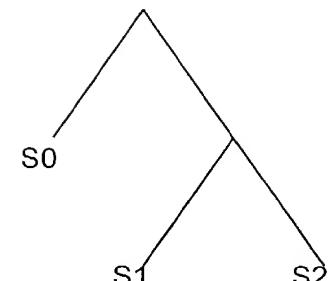S0   0.5

S1   0.25
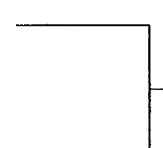
S2   0.25

(a)

(b)

Figure 1

Symbol	Huffman Code I	Huffman Code II	Huffman Code III	Huffman Code IV
S0	0	0	1	1
S1	10	11	01	00
S2	11	10	00	01

Figure 2

Symbol	Length (bits)	Huffman code
S0	5	11100
S1	0	-
S2	0	-
S3	0	-
S4	4	0110
S5	4	0111
S6	4	1000
S7	4	1001
S8	3	000
S9	4	1010
S10	4	1011
S11	3	001
S12	3	010
S13	5	11101
S14	4	1100
S15	6	111110
S16	4	1101
S17	5	11110
S18	6	111111

Figure 3

Symbol	Codeword
a	00
b	01
c	100
d	101
e	110
f	1110
g	11110
h	11111

Encoding Table

Decoding Tree

Figure 4
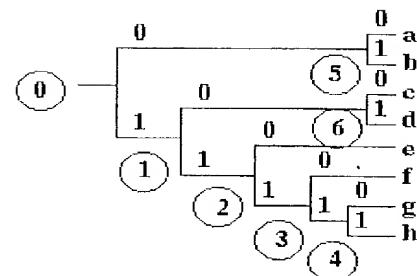
Memory Address		Output	
Node	Input	Next-Node/ [Codeword]	Termination Flag
0	0	5	0
0	1	1	0
1	0	6	0
1	1	2	0
2	0	[e]	1
2	1	3	0
3	0	[f]	1
3	1	4	0
4	0	[g]	1
4	1	[h]	1
5	0	[a]	1
5	1	[b]	1
6	0	[c]	1
6	1	[d]	1

Figure 5

Index	Symbol	Length (bits)	Huffman code
-	S1	0	-
-	S2	0	-
-	S3	0	-
0	S8	3	000
1	S11	3	001
2	S12	3	010
3	S4	4	0110
4	S5	4	0111
5	S6	4	1000
6	S7	4	1001
7	S9	4	1010
8	S10	4	1011
9	S14	4	1100
10	S16	4	1101
11	S0	5	11100
12	S13	5	11101
13	S17	5	11110
14	S15	6	111110
15	S18	6	111111

Figure 6

New Data structure 1 – NDS1[ ]		
NDS1[bits]	Ref_Code	Base_Index
NDS1[1]	111111	-1
NDS1[2]	111111	-1
NDS1[3]	000000	0
NDS1[4]	011000	3
NDS1[5]	111000	11
NDS1[6]	111110	14

(a)

New Data structure 2 – NDS2[ ]		
NDS2[bits]	Base_Code	Base_Index
NDS2[1]	111111	-1
NDS2[2]	111111	-1
NDS2[3]	000	0
NDS2[4]	0110	3
NDS2[5]	11100	11
NDS2[6]	111110	14

(b)
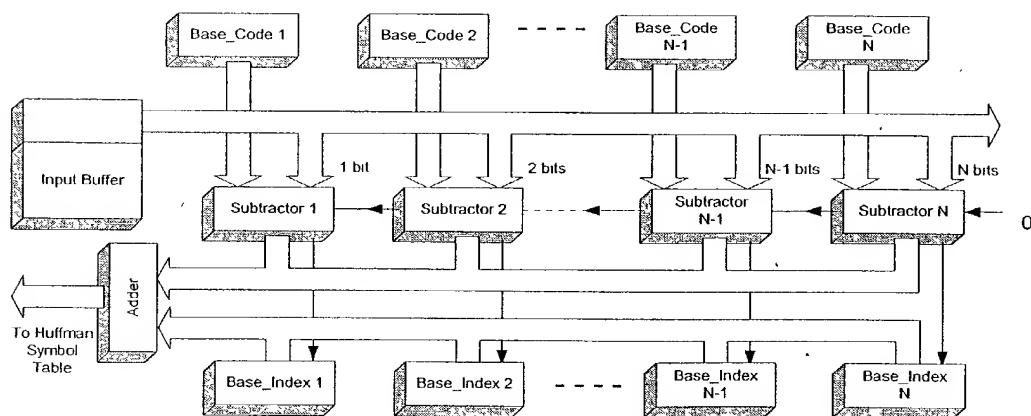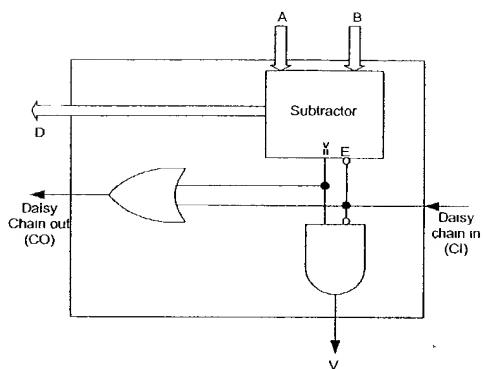
Figure 7

Figure 8

Input		Output		
A>=B	CI	CO	V	D
X	1	1	0	H
1	0	1	1	A - B
0	0	0	0	H

H: High Impedance

Figure 9